

MULTILIGAMENT INJURED KNEE, GUIDELINES

MULTILIGAMENT INJURED KNEE

DEFINITION

At least 2 ligaments torn!

Complete tear of one cruciate ligament

+

Partial or complete tear of any other 3 ligaments



MULTILIGAMENT INJURED KNEE

A complex problem arising from Acute knee dislocation (0.02%)

- Anterior cruciate ligament
- Posterior cruciate ligament
- Medial collateral ligament
- Lateral collateral ligament



CLASSIFICATION OF KNEE DISLOCATION

- Based on the direction the tibia dislocates relative to the femur.
- *Anterior, Posterior, Lateral, Medial, Rotatory*
- the injury is open or closed,
- “high-energy”, “low-energy”, “ultra low energy” trauma



INCIDENCE

Most common direction of dislocation:-

- Anterior – 40%
- Posterior – 33%
- Lateral --18%
- Medial -- 4%
- Rotatory dislocations – 5%

Based on patient presentation

- First 3 weeks – **ACUTE**
- 3 weeks to 3 months – **SUB ACUTE**
- More than 3 months - **CHRONIC**

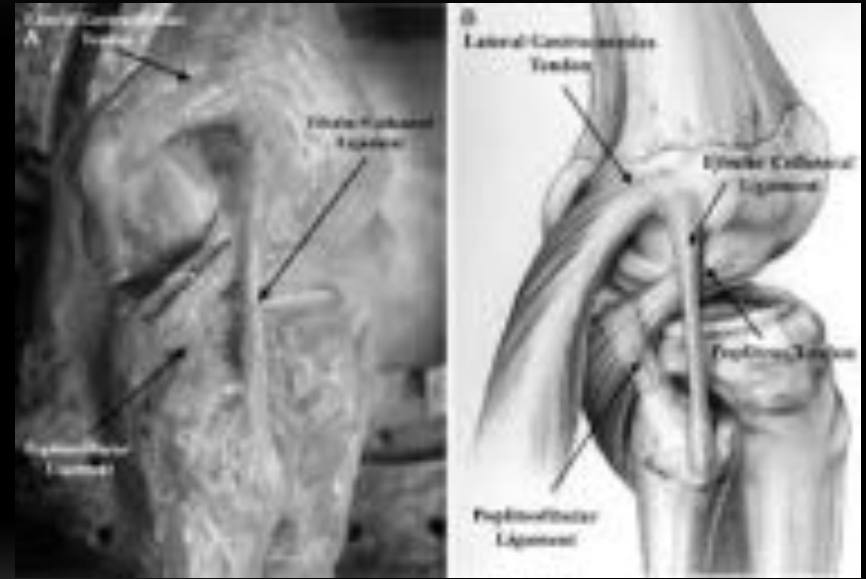
MULTILIGAMENT INJURED KNEE

Knee Dislocation

- KD-I - ACL + MCL or LCL (PCL-intact knee dislocation)
 - PCL + MCL or LCL (ACL- intact knee dislocation)
- KD-II - ACL and PCL torn, collateral ligaments intact
- KD-IIIM - ACL, PCL, and M Corner torn, lateral side intact
- KD-IIIL - ACL, PCL, and L corner torn, medial side intact
- KD-IV - All four ligaments torn (ACL, PCL, MCL, LCL)

Schenck classification

MEDIAL AND LATERAL KNEE CORNERS



Mechanisms of Injury

Anterior dislocation -
Hyperextension force

At 30° of hyperextension,
posterior capsule fails.

Further hyperextension to
50° → ACL, PCL, and popliteal
artery fails.



Mechanisms of Injury

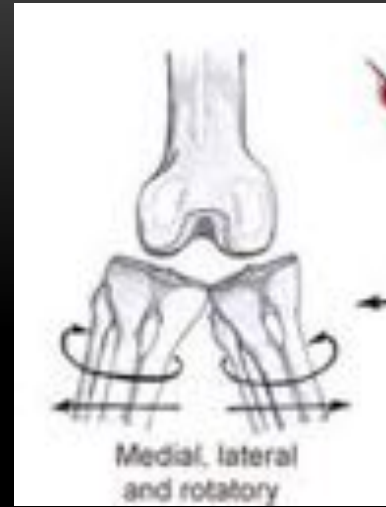
- Dash- board” injury.
- A posterior-directed force applied when the knee is flexed to 90°.

POSTERIOR DISLOCATION



Mechanisms of Injury

- **Medial and lateral dislocations** result from varus/ valgus stresses applied to the knee.
- **Rotatory dislocations** - A combination of varus/ valgus stress + hyperextension/blow to proximal tibia will likely produce.



POSTERO-LATERAL DISLOCATION

Flexed knee goes into severe abduction and IR

- Most common combination.
- Button holing of medial femoral condyle into the antero-medial joint capsule.
- The MCL invaginates into the joint space, blocking reduction.
- Hence the skin is dragged in to the joint line.



Dimple Sign →



THE INITIAL EVALUATION

Complete dislocation may spontaneously reduce (30-54%), and any triple- ligament knee injury constitutes a frank dislocation !

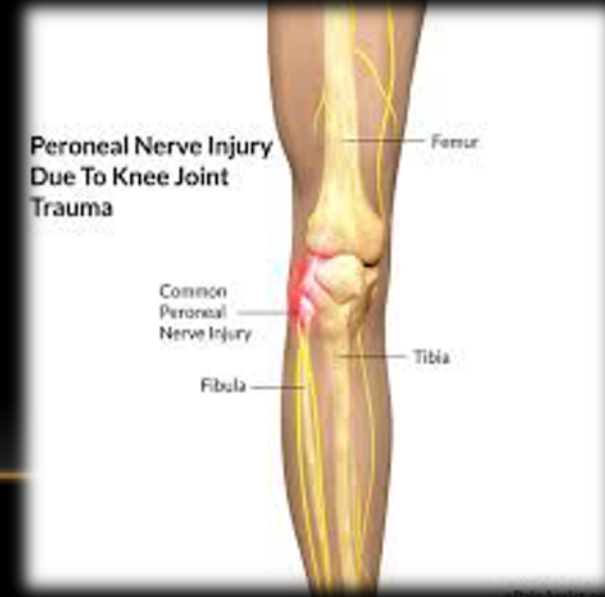
One third cases may have N/V injuries

CAUTION

- Recognition of potential vascular injury (Ischemia > 8 hours → Amputation)
- Neurologic examination

Neurological Injury

- Peroneal nerve, 10% to 40% (Avg. 15%)
- Most common with posterolateral dislocation
- Mostly its tension, complete rupture is rare
- Nearly 50% result in permanent neurological deficits
- Recovery signs come earlier in Superficial peroneal distribution



VASCULAR COMPROMISE

Overall Incidence - 16-64% (Avg 32%)
M/C in Posterior dislocation (44% vs 39%)
58% incidence in morbidly obese

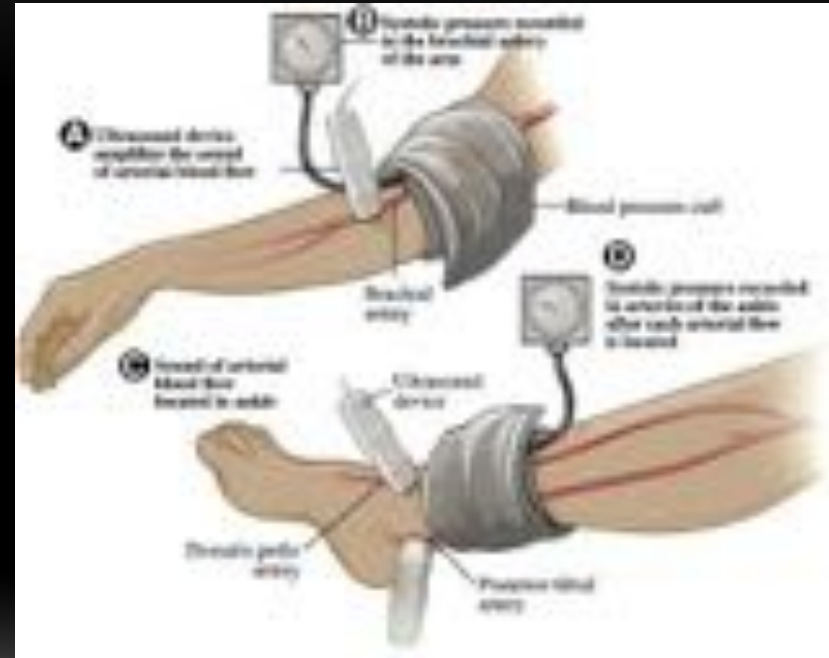


Mechanism of Vascular Injury

- STRECHING MECHANISM $\xrightarrow[\text{tears}]{\text{Intimal}}$ Anterior dislocation.
- DIRECT CONTUSION $\xrightarrow{\text{Transactions}}$ Posterior dislocation.

VASCULARITY ASSESSMENT

- Dorsalis pedis and posterior tibial pulsations (not enough)
- Even if pulses are present, the ankle-brachial index (ABI)
- ABI is more than 0.90, close observation is warranted
- ABI is less than 0.90, arteriography is indicated



Known or suspected knee dislocation



Reduce knee

Check pulses and ABPI



Distal pulses present
and ABPI >0.9



Admit for 24 hours



Distal pulses present
but ABPI <0.9
Distal pulses asymmetric
Any other clinical concern

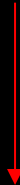


Arteriography, CT Angiogram

Distal pulses absent



Signs of vascular injury
(ischemia, hemorrhage, hematoma)



Vascular consult, immediate surgery, +/- on
table angiography



MANAGING ACUTE DISLOCATION

- An **ORTHOPAEDIC EMERGENCY** → IMMEDIATE REDUCTION
- **METHOD:** Longitudinal traction to the leg from the ankle and manipulation of proximal Tibia
- After reduction – N/V examination and CHECK X-Ray



AFTER REDUCTION

- Limb in long leg splint or extension knee immobilizer.
- A “bump” consisting of a towel or pad behind the gastrocnemius-soleus bulk
- X ray evaluation - check for posterior subluxation



Role of External fixator

- **Unable to maintain reduction in brace even if early reconstruction**
- **Hinged knee – spanning Ex-Fix is preferable.**
- **Pin site should not compromise future incisions or tunnels**
- **After Ex-fix ensure no posterior subluxation remains**



ABSOLUTE SURGICAL INDICATIONS

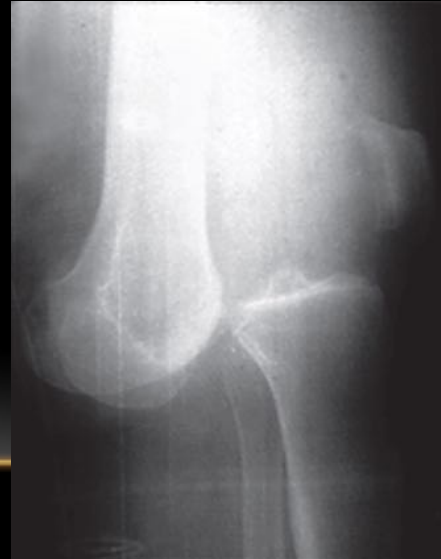
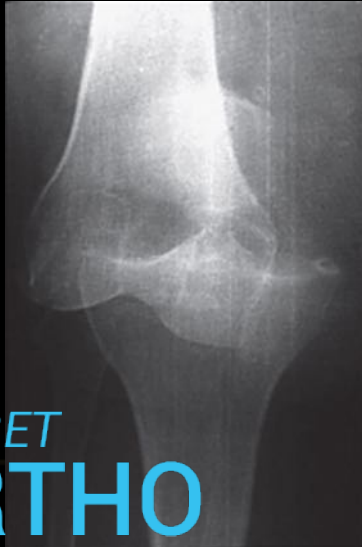
- Vascular compromise
- Irreducibility ?? DIMPLE SIGN
- Unstable reduction → External fixator
- Warm Ischemia time more than 6 hours -
Four-compartment fasciotomy of the limb
- Open dislocations and open/ closed fracture dislocations



CR may not be successful

THE IMAGING

Before any manipulation,
X-ray (AP and Lateral radiographs)



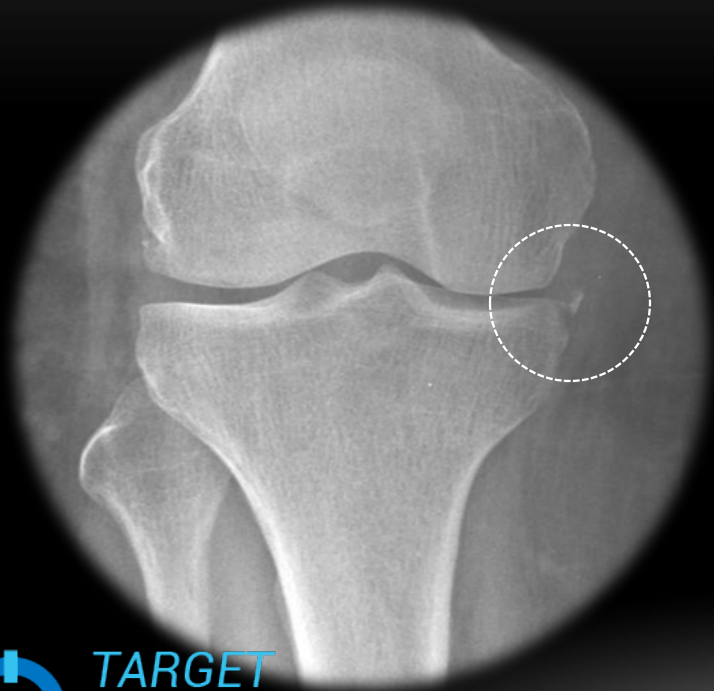
PCL AVULSION



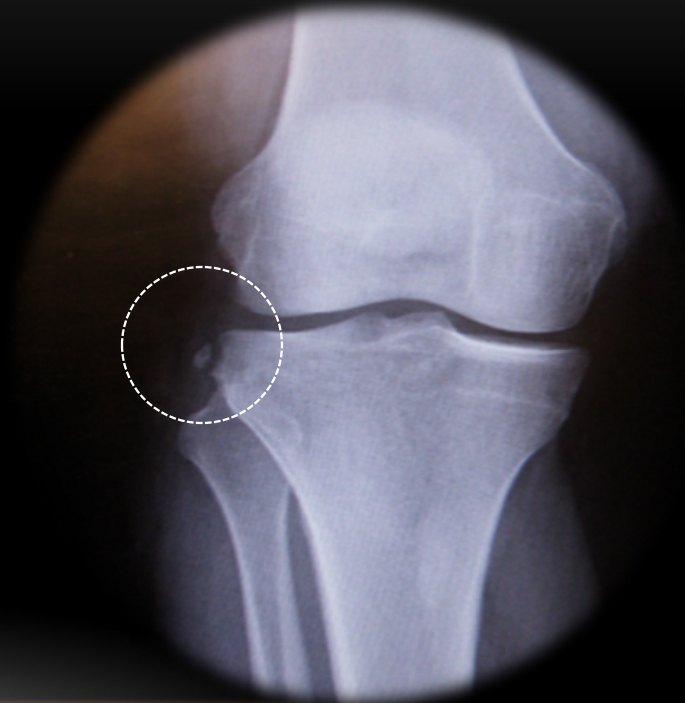
ACL AVISION



REVERSE SECOND



SECOND SIGN



POSTERO LATERAL CORNER INJURY

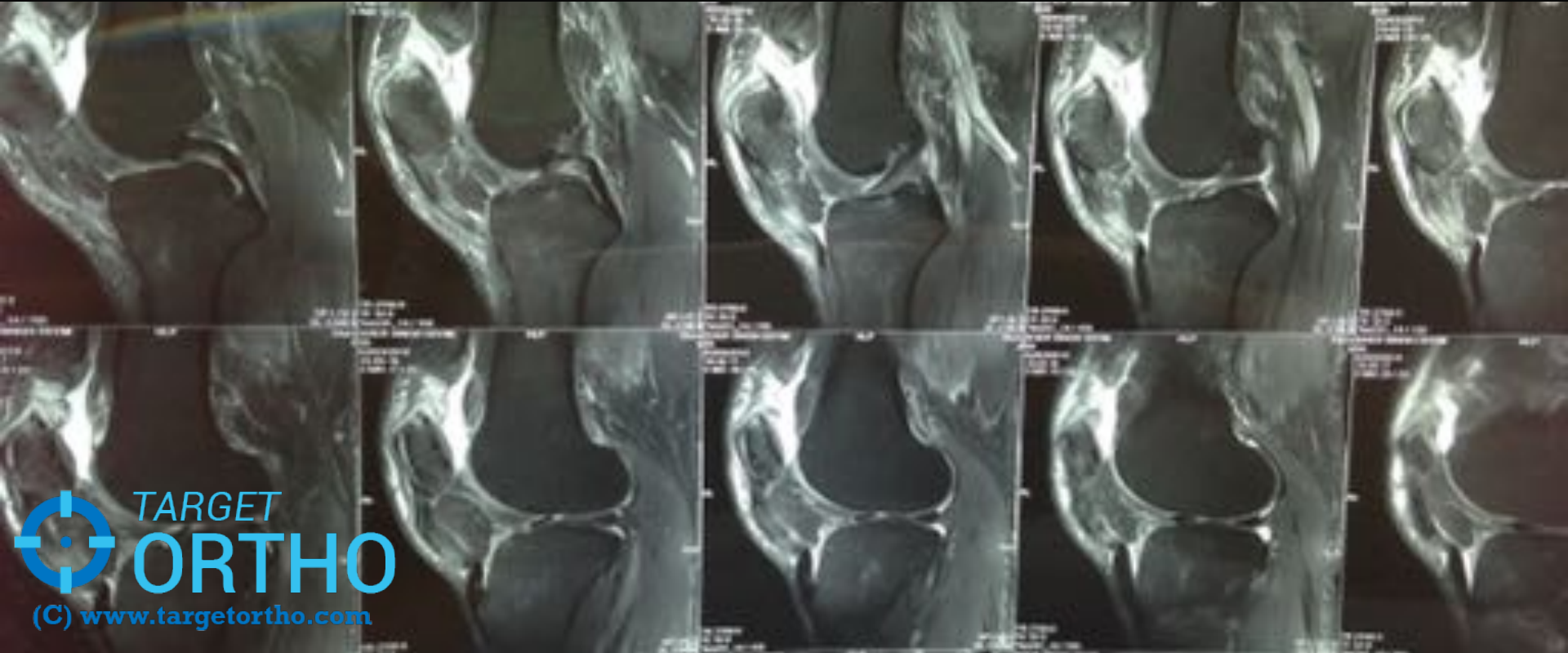


ARCULATE
SIGN



MRI STUDIES

? *TIMING* ?



AFTER MANAGING THE ACUTE EPISODE

ACCESS DAMAGE BY RELVANT **CLINICAL TESTS** TO KNOW
THE LIGAMENTS INJURED



PLAN FOR DEFINITIVE MANAGEMENT

SURGICAL TIMING

- **HISTORICALLY** - closed reduction and plaster immobilization in preference to early ligament repair or reconstruction was recommended.
- **CURRENTLY** - most recommend early ligament repair or reconstruction and aggressive rehabilitation, especially in young active patients.

SURGICAL TIMING

- vascular status
- skin condition
- systemic injuries
- open versus closed knee injury
- other orthopedic injuries

Reduction stable

ROM > 90°

Active inflammation settled

SINGLE CRUCIATE ACL/ PCL + MCL (GRADE 3)

ACL /PCL + MCL/ POL
(Chronic injury, > 3 months)

↓

Single Stage Reconstruction

ACL/PCL + MCL/ POL
< 3 weeks old

↓

Reconstruct Cruciate + MCL/ POL repair

↓

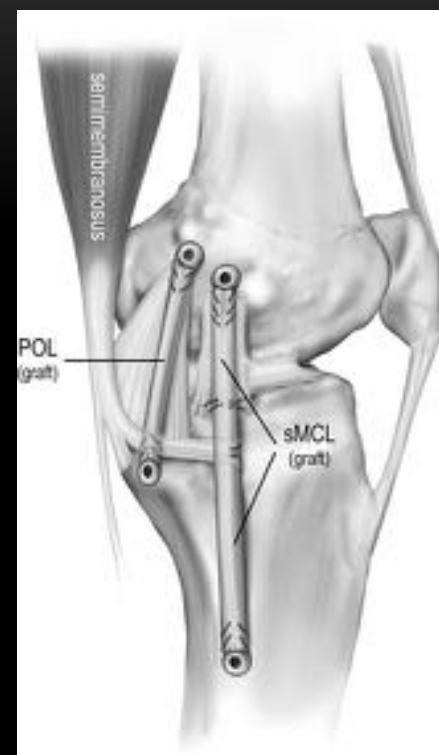
Hinged knee brace

↓

Medial instability after 6 weeks

↓

Reconstruction of MCL + POL





SINGLE CRUCIATE ACL/ PCL + PLC INJURY

Grading of PLC first

- **Type A** - > ER only (Popliteofibular ligament, and Popliteus tendon torn).
- **Type B** - > ER + 5 mm lateral joint line opening to varus stress at 30° knee flexion (Popliteofibular ligament + popliteus tendon + fibular collateral ligament).
- **Type C** - > ER + 10 mm lateral joint line opening to varus stress at 30° of knee flexion (Popliteofibular ligament, popliteus tendon, fibular collateral ligament, and lateral capsular avulsion, in addition to **cruciate ligament disruption**)

POSTEROLATERAL INSTABILITY TYPE A

Increased ER > 10 degree only,
VARUS STRESS - Normal

Popliteofibular ligament, and
Popliteus tendon injured.

INTACT LCL AND PCL/ACL

+ ve DIAL TEST AT 30 degree



-- ve DIAL TEST AT 90 degree

Conservative

POSTEROLATERAL INSTABILITY TYPE B

Increased ER > 10 degree only,
VARUS STRESS – 5-10 mm opening

Popliteofibular ligament,
Popliteus tendon and LCL torn.

INTACT PCL/ ACL

+ ve DIAL TEST AT 30 degree



-- ve DIALTEST AT 90 degree

POSTEROLATERAL INSTABILITY TYPE C

Increased ER > 10 degree only,
VARUS STRESS – >10 mm opening

Popliteofibular ligament,
Popliteus tendon and LCL torn.
Cruciate also torn

+ ve DIAL TEST AT 30 degree



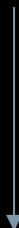
+ ve DIALTEST AT 90 degree

SINGLE CRUCIATE ACL/ PCL + **PLC INJURY**

Type B or C

First stage PCL/ ACL

> 6 weeks



PLC repair reconstruction

One stage PCL/ ACL

+ PLC Augmented repair

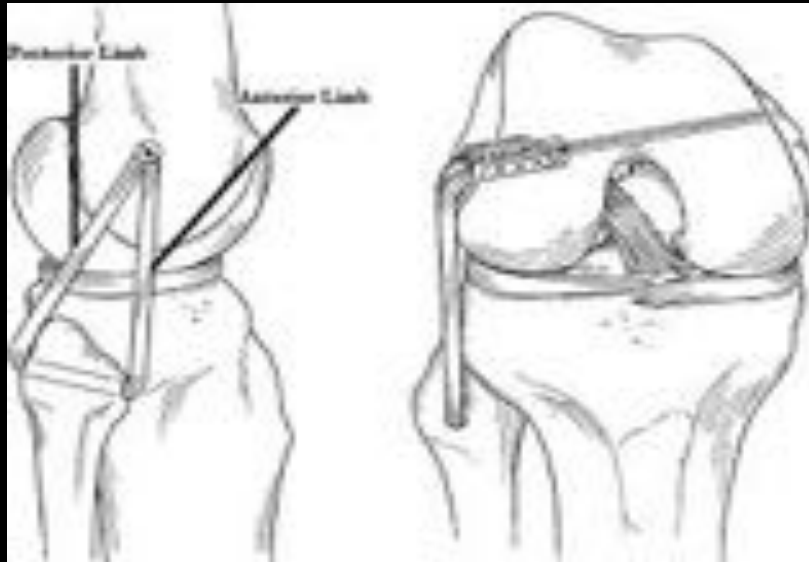


Grafts

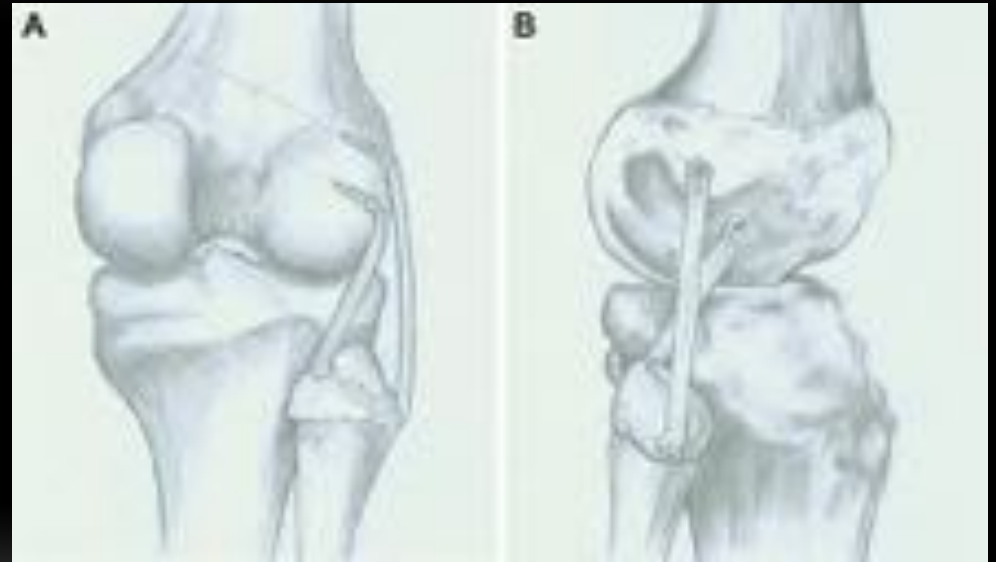
Type B (Modified Larson)

Type C (Modified Laprade)

LARSON'S TECH.



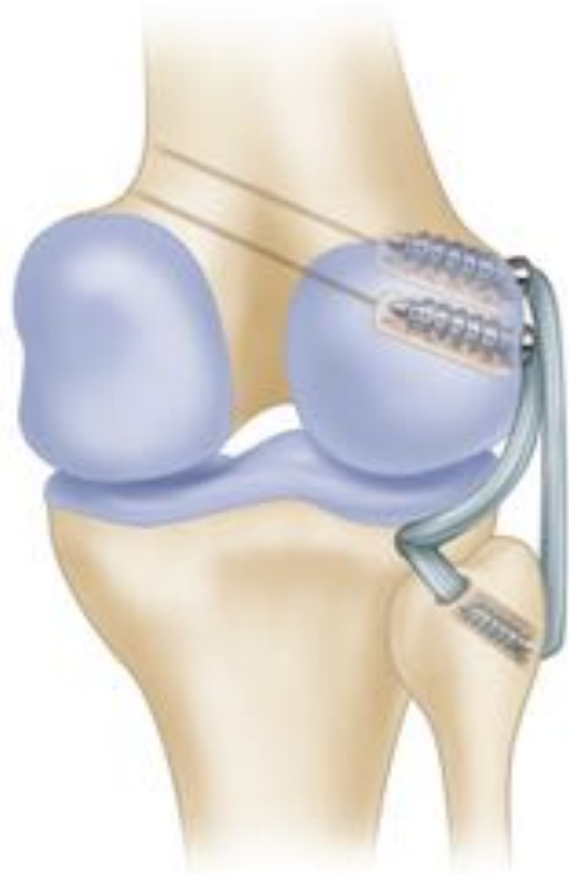
MODIFIED LARSON'S





Modified

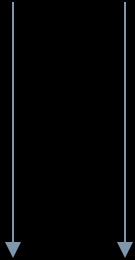
LAPRADE'S TECHNIQUE



BI-CRUCIATE INJURY (ACL + PCL)

One stage ACL + PCL reconstruction

PCL tibial tunnel
PCL femoral tunnel
ACL tibial tunnel
ACL femoral tunnel



Two stage reconstruction

PCL tibial tunnel
ACL tibial tunnel
PCL femoral tunnel
ACL femoral tunnel

FIRST STAGE: PCL

SECOND STAGE: ACL
(3 months)

BI-CRUCIATE INJURY (ACL + PCL)

GRAFTS

ONE STAGE

TWO STAGE

ACL + PCL + MCL (GRADE 3)

Grafts

< 3 weeks

One stage ACL+PCL
reconstruction
with
MCL + POL repair

Early rehabilitation in
Hinged brace

> 3 weeks

Two staged

First ACL + PCL reconstruction

Medial instability persists
Then late MCL reconstruction

ACL + PCL + PLC (TYPE B/ C)

One staged combined ACL+ PCL+PLC

Two staged; First PCL + PLC reconstruction
late (3 months) ACL reconstruction

Sequence of graft tensioning

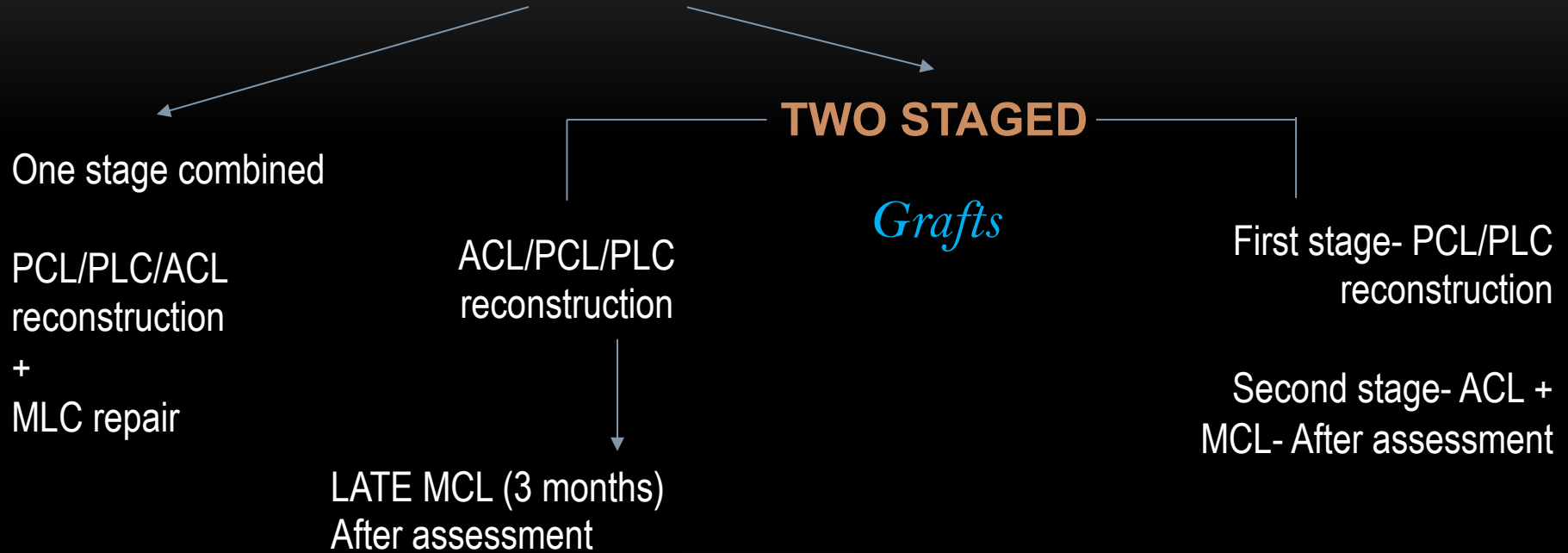
PCL tensioned at 90 degree giving anterior drawer

PLC tensioned at (slight) varus stress and internal rotation

ACL tensioned at full extension

Grafts

ACL + PCL + MCL (GRADE 3) + PLC (TYPE B/ C)



REHABILITATION

- ? BRACE - PCL BRACE
- ? KNEE BENDING - No knee bending till 6 weeks (except Prone)
- ? WEIGHT BEARING- 6 weeks (never till 3 weeks)
- ? STRENGTHENING- isometric immediate; rest after 6 weeks
- ? Return to Sports- Preferably 9 months



REHABILITATION

0-6 weeks: NWB and No supine knee bending

2-6 weeks: Prone Knee bending (0-90°)

6 weeks- 8 weeks: ROM > 90°. Full WB

8-12 weeks: ROM- Active (Non resistive);
Quadriceps squats < 70° to avoid stresses on
PCL; Avoid ER (Only closed chain exercises)

➤ 12 weeks: Open chain strengthening

THANKS

